A platform for retrieval, analytics, and visualization of MODIS & VIIRS land products

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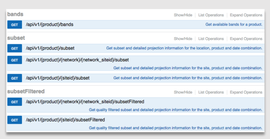
https://modis.ornl.gov

1. Introduction

- The ORNL DAAC's MODIS/VIIRS Subsetting and Visualization Tools Suite provides on-demand, user-defined subsets of several MODIS and VIIRS land products in user-friendly formats and scales.
- Serving the land science community since 2007 for validating remote sensing products, characterizing field sites, and in modeling studies. Recent updates include addition of 1) MODIS Collection 6 products, 2) VIIRS/S-NPP products, and 3) Daymet (daily surface gridded weather data) for the Fixed Sites Subset Tool.
- Consists of primarily three tools for retrieval of spatio-temporal subsets, and visualization and analytics for the subset data:

Global Subsets Tool
create subsets for user-defined locations and extents

Fixed Sites Subsets Tool
includes pre-processed cutouts for more than 2000 field sites



Web Service
REST-ful API to retrieve user defined subsets programmatically

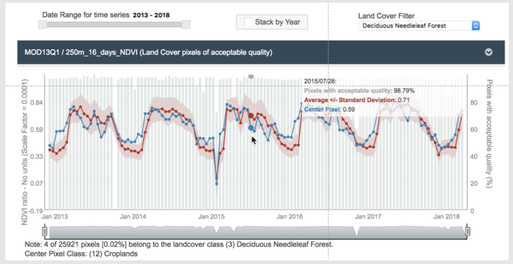
2. MODIS/VIIRS Land Subset Products Offered

4 VIIRS and 21 MODIS land products

MODIS Terra, Aqua and Combined Products (Collection 6) (2000 – present)	
Variables	Products
LAI/FPAR	MOD15A2H (8-Day), MYD15A2H (8-Day), MCD15A2H (8-Day), MCD15A3H (4-Day)
BRDF/Albedo/NBAR/MAIAC	MCD43A, MCD43A4 (Daily), MCD19A3 (8-Day)
Reflectance	MOD09A1 (8-Day), MYD09A1 (8-Day)
Surface Temperature/Emissivity	MOD11A2 (8-Day), MYD11A2 (8-Day)
Vegetation Indices	MOD13Q1 (16-Day), MYD13Q1 (16-Day)
Evapotranspiration	MOD16A2 (8-Day), MYD16A2 (8-Day)
GPP	MOD17A2H (8-Day), MYD17A2H (8-Day)
NPP	MOD17A3H (Yearly), MYD17A3H (Yearly)
Land Cover Type	MCD12Q1 (Yearly)
Phenology	MCD12Q2 (Yearly) (Collection 5)
VIIRS/S-NPP Products (Collection 1) (2012 – present)	
LAI/FPAR	VNP15A2H (8-Day)
Reflectance	VNP09H1 (8-Day), VNP09A1 (8-Day)
Vegetation Indices	VNP13A1 (16-Day)

3. Global Subset Tools

- Recommended quality filtering and scaling applied to the science bands
- Filtering based on land cover type
- Supplementary information for each order: land cover type, phenology, and R code and graphics
- Subset in CSV and GeoTIFF formats (projected to geographic or sinusoidal grid system)
- Email delivery of the order and an order history page to manage past orders



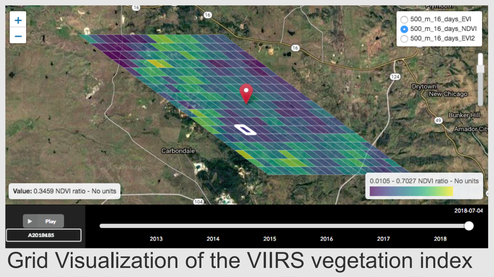
Time Series Visualization of a MODIS vegetation index (MOD13Q1) subset. An example order delivery page: https://modis.ornl.gov/example

Tool Usage (2017/10/01 – 2018/09/31): 2,186 unique users, **20,885** subset orders, **18.2** TB of data

Tool Citation: ORNL DAAC. 2018. MODIS and VIIRS Land Products Global Subsetting and Visualization Tool. ORNL DAAC, Oak Ridge, Tennessee, USA. https://doi.org/10.3334/ORNLDAAC/1379

4. Fixed Sites Subset Tools

- Preprocessed cutouts of about 8km x 8km area for field and flux tower sites.
- 2000+ sites including AmeriFlux, FluxNet, USCRN, AERONET, NEON, and others
- Daymet (daily surface gridded weather data) for the active North American sites
- Data and visualizations accessible using the network IDs:
  - e.g., "https://modis.ornl.gov/cgi-bin/sites/site/?network=**NEON**&network_siteid=**CPER**&product=**MCD15A2H**" for the NEON site Central Plains Experimental Range (CPER) for MCD15A2H product.



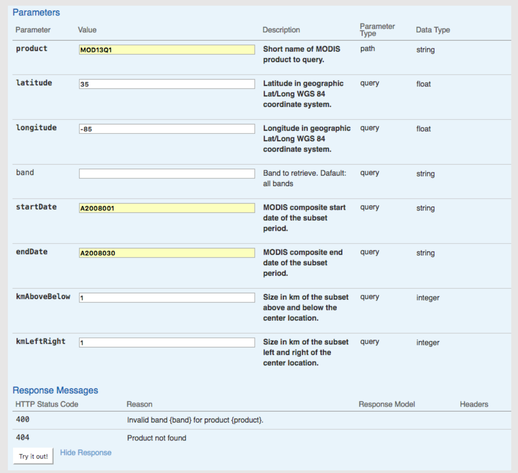
Grid Visualization of the VIIRS vegetation index (VNP13A1) for the AmeriFlux site US-Ton

Tool Usage (2017/12/07 – 2018/09/31): 660 unique IP addresses, **7,282** subset orders, **269** GB of data

Tool Citation: ORNL DAAC. 2018. MODIS and VIIRS Land Products Fixed Sites Subsetting and Visualization Tool. ORNL DAAC, Oak Ridge, Tennessee, USA. https://doi.org/10.3334/ORNLDAAC/1567

5. REST Web Service

- Offers responses in either CSV or JSON format.
- Based on the Open API specifications
- Provides pre-processed data (raw, quality filtered and subset statistics) from the Fixed Sites Subset Tools, e.g.,
  `/api/{product}/{siteid}/subset/` or
  `/api/{network}/{network_siteid}/subsetFiltered/`
- Clients: MODISTools R package by Dr. Koen Hufkens (https://github.com/khufkens/MODISTools). Python package by Dr. Tristan Quaife in development.
- Learning resources at: http://modis.ornl.gov/resources.html#elearning



Graphical user interface to enable testing of the REST Web Service

Tool Usage (2018/05/04 – 2018/09/31): 437 unique IP addresses, **1,660,170** subset requests, **11** GB of data

Tool Citation: ORNL DAAC. 2018. MODIS and VIIRS Land Product Subsets RESTful Web Service. ORNL DAAC, Oak Ridge, Tennessee, USA. https://doi.org/10.3334/ORNLDAAC/1600

6. Future Updates

- Additional NASA-processed VIIRS products as they are released in the coming months
- Additional MODIS products related to fire, land surface temperature, and albedo. Possibly leverage the LP DAAC's Application for Extracting and Exploring Analysis Ready Samples (AppEEARS) API to offer more products, especially the daily products
- Other related products to land science and ecology community (e.g. solar-induced chlorophyll fluorescence SIF products) as we position the platform toward multi-sensor capabilities.

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